

Year 12 Physics - Math review

SOLUTIONS

Sheet 2: Units – No calculator allowed!

1) Write in scientific notation form (i.e. standard form)

a) $70000 = 7.0 \times 10^4$

b) $-2350000 = -2.35 \times 10^6$

c) $0.0009 = 9.0 \times 10^{-4}$

d) $-0.00000356 = -3.56 \times 10^{-6}$

2) Metric units

Prefix	Symbol	Power (or Standard form)
Giga	G	10^9
Mega	M	10^6
Kilo	k	10^3
Milli	m	10^{-3}
Micro	μ	10^{-6}
Nano	n	10^{-9}
Pico	p	10^{-12}

3) SI units

All quantities and measurements must always have a unit. The internationally agreed upon units are called the S.I. units:

Quantity		S.I. Unit	
Name	Symbol	Name	Symbol
Length	l	metre	m
Mass	m	kilogram	kg
Time	t	second	s
Electric current	I	ampere	A
Temperature	T	kelvin	K
Luminous intensity	I	candela	cd
Amount of substance	N	mole	mol

Units and quantities are different things. Quantities are physically measurable things (e.g. length). Units are what we decide to measure in (e.g. metres or kilometres). They each have their own symbols. Don't confuse them.

3) Derived units

All other units are called derived units, i.e. they are made up or 'derived' from the basic SI units. Derived units are often called non-SI units. (Hint: It is often helpful to write a formula to help derive the basic SI units)

Quantity	Unit	Formula	Basic SI units
Velocity	ms^{-1}	$v = \frac{d}{t}$	ms^{-1}
Force (general)	N	$F = ma$	kg ms^{-2}
Force (centripetal)	N	$F_c = \frac{mv^2}{r}$	kg m s^{-2}
Force (weight)	N	$F_w = mg$	kg m s^{-2}
Energy (potential)	J	$E_p = mgh$	$\text{kg m}^2 \text{s}^{-2}$
Energy (kinetic)	J	$E_k = \frac{1}{2}mv^2$	$\text{kg m}^2 \text{s}^{-2}$
Work	J	$W = Fd$	$\text{kg m}^2 \text{s}^{-2}$

4) Unit conversions

a)	Change 8km to m	8000m
b)	How many micrograms are in a kilogram?	$10^6 \times 10^3 = 10^9$
c)	Write 2.8×10^{10} watts in gigawatts	$2.8 \times 10^{10} \times 10^{-9} = 2.8 \times 10^1 = 28\text{GW}$ Or: $2.8 \times 10^9 \times 10^1 = 2.8\text{GW} \times 10^1 = 28\text{GW}$
d)	Change 50km/h to m/s	$50000 / (60 \times 60) = 13.89 \text{ ms}^{-1} = 14 \text{ ms}^{-1} (2 \text{ s.f.})$

5) More quantities and units

Complete activity 1A from the green text book.